

CLAIMS:

1. A polymer gel electrolyte comprising:

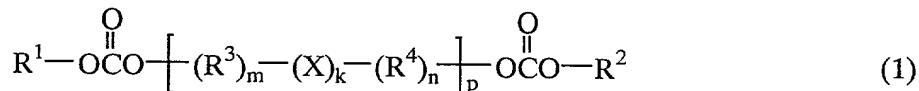
5 an electrolyte solution containing a plasticizer with
at least two carbonate structures on the molecule and an
electrolyte salt, and
a matrix polymer.

2. The polymer gel electrolyte of claim 1 which consists

10 essentially of the plasticizer with at least two carbonate
structures on the molecule, the electrolyte salt, and the
matrix polymer.

3. The polymer gel electrolyte of claim 1 or 2 in which

15 the plasticizer with at least two carbonate structures on
the molecule is a compound of general formula (1) below



wherein R¹ and R² are each independently a substituted or
unsubstituted monovalent hydrocarbon group of 1 to 10
20 carbons, and R³ and R⁴ are each independently a substituted
or unsubstituted divalent hydrocarbon group of 1 to 20
carbons, with the proviso that any two of the moieties R¹,
R², R³ and R⁴ may together form a ring; X is -OCO-, -COO-,
-OCOO-, -CONR⁵-, -NR⁶CO- (R⁵ and R⁶ being hydrogen or an alkyl
25 of 1 to 4 carbons), -O- or an arylene group; and the letters
m, n, k and p are each independently 0 or an integer from 1
to 10.

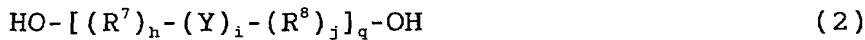
4. The polymer gel electrolyte of claim 3, wherein some

30 or all of the hydrogen atoms on the plasticizer of general
formula (1) having at least two carbonate structures on the
molecule are substituted with halogen atoms.

5. The polymer gel electrolyte of any one of claims 1 to 4, wherein the matrix polymer is an unsaturated polyurethane compound prepared by reacting:

(A) an unsaturated alcohol having at least one (meth)acryloyl group and a hydroxyl group on the molecule;

5 (B) a polyol compound of general formula (2) below



10 wherein R^7 and R^8 are each independently a divalent hydrocarbon group of 1 to 10 carbons which may contain an amino, nitro, carbonyl or ether group,

Y is -COO-, -OCOO-, -NR⁹CO- (R^9 being hydrogen or an alkyl group of 1 to 4 carbons), -O- or an arylene group,

15 the letters h, i and j are each independently 0 or an integer from 1 to 10, and

the letter q is a number which is ≥ 1 ;

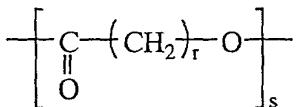
(C) a polyisocyanate compound; and

(D) an optional chain extender.

20 6. The polymer gel electrolyte of any one of claims 1 to 4, wherein the matrix polymer is a polymeric material having an interpenetrating network structure or a semi-interpenetrating network structure.

25 7. The polymer gel electrolyte of claim 6, wherein the polymeric material having an interpenetrating network structure or a semi-interpenetrating network structure comprises a hydroxyalkyl polysaccharide derivative, a 30 polyvinyl alcohol derivative or a polyglycidol derivative in combination with a crosslinkable functional group-bearing compound, part or all of which compound is the unsaturated polyurethane compound of claim 5.

35 8. The polymer gel electrolyte of any one of claims 1 to 4, wherein the matrix polymer is a thermoplastic resin containing units of general formula (3) below



(3)

in which the letter r is an integer from 3 to 5, and the letter s is an integer ≥ 5 .

5 9. The polymer gel electrolyte of any one of claims 1 to 4, wherein the matrix polymer is a fluoropolymer material.

10 10. The polymer gel electrolyte of any one of claims 1 to 9, wherein the electrolyte salt is at least one selected from the group consisting of alkali metal salts, quaternary ammonium salts, quaternary phosphonium salts and transition metal salts.

15 11. A secondary cell comprising a positive electrode, a negative electrode and an electrolyte, wherein the electrolyte is a polymer gel electrolyte according to any one of claims 1 to 10.

20 12. The secondary cell of claim 11, wherein the negative electrode includes a negative electrode active material which is lithium, a lithium alloy or a carbon material capable of adsorbing and releasing lithium ions.

25 13. The secondary cell of claim 11 or 12, wherein the positive electrode includes a positive electrode active material which is an electrically conductive polymer, a metal oxide, a metal sulfide or a carbonaceous material.

30 14. An electrical double-layer capacitor comprising a pair of polarizable electrodes and an electrolyte between the polarizable electrodes, wherein the electrolyte is a polymer gel electrolyte according to any one of claims 1 to 10.

15. The electrical double-layer capacitor of claim 14,
wherein the polarizable electrodes contain activated carbon
which is prepared by subjecting a mesophase pitch-based
carbon material, a polyacrylonitrile-based carbon material,
5 a gas phase-grown carbon material, a rayon-based carbon
material or a pitch-based carbon material to alkali
activation with an alkali metal compound, then grinding the
activated carbon material.